We claim:

1. A method for a beaconing protocol for a device to participate in an ad hoc communications network of devices, comprising the steps of:

a. dividing the medium access time into a periodic sequence of at least one superframe (102) beginning at a given start time (101) and having a next superframe of the periodic sequence at any point in time;

b. partitioning the superframe (102) into a slotted beaconing period (106) having a plurality of contiguous beacon slots (105) followed by a data transfer period (103);

c. performing at least one of

- starting a new ad hoc network by performing steps (a) – (f),
- occupying an idle beacon slot of the plurality of contiguous beacon slots, and
- sleeping until the start of the next beaconing period and then waking up and repeating step (c);

d. beaconing an own beacon at said occupied beacon slot;

e. receiving data transmissions from the other devices during the data transfer period;

f. transferring data to the other devices during the data transfer period.

2. The method of claim 1, wherein the beaconing step further comprises the step of: transmitting a beacon comprising at least one set of information selected from the group consisting of device identification information and capabilities, a traffic identification map (TIM), a beacon slot occupancy field, related mesh network, and distributed reservations of the medium.

3. The method of claim 2, further comprising the step of:

receiving other beacons from other devices during the slotted beaconing period (104) of a superframe (102), said other beacons comprising at least one set of information selected from the group consisting of device identification information and capabilities, a traffic identification map (TIM), a beacon slot occupancy field, related mesh network, and distributed reservations of the medium; and

wherein the beaconing step further comprises including in the own beacon information comprising at least one set of information selected from the group consisting of device identification information and capabilities, a traffic identification map (TIM), a beacon slot occupancy field, related mesh network information, and reservations of the medium.

4. The method of claim 3, further comprising the step of discovering the other devices during the time of one superframe (102) once the other beacons have been received.

5. The method of claim 3, further comprising the steps of:

waking up at the start (101) of the next superframe;

if a TIM of any of the received other beacons is addressed to the device, performing the steps of:

i. remaining awake during the data transfer period (103) of the superframe (102) if the TIM is not clear,

ii. going to sleep during the data transfer period (103) of the superframe (102) when the TIM is clear; and

iii. going to sleep if a data frame is received during the data transfer period (103) of the superframe with a "More Data" bit set to zero.

6. The method of claim 3, further comprising the steps of:

receiving information in other beacons regarding the neighborhood of the device; and

using the information received regarding the neighborhood of the device to find a transmission path based on a criteria selected from the group consisting of fewest hops and least cost.

7. The method of claim 3, further comprising the steps of:

from the slot occupancy information in the received beacon, determining for each beacon slot (105) of said plurality of contiguous beacon slots (104) if the beacon slot (105) is one of idle and received incorrectly;

if, for a pre-determined number of consecutive superframes, the beacon slot (105) occupied by the device is determined to be one of idle, received incorrectly, and comprising an information of an other device then a collision is deemed to have occurred in the beacon slot (105) occupied by the device and the device performs step (c) to resolve the collision.

8. The method of claim 3, wherein:

the transferring step further comprises transferring data during the data transfer period (103) corresponding to a reservation of the medium transmitted in an own beacon; and

the beaconing step further comprises retaining the reservation of the medium until the data transfer is completed.

9. The method of claim 8, wherein the reservation of medium access during the data transfer period (103) of a superframe (102) is based on one of the reservation mechanisms selected from the group consisting of an enhanced distributed channel access (EDCA) mechanism and a distributed reservation mechanism.

10. The method of claim 1, wherein:

the superframe (102) comprises a first pre-determined number of medium access slots (107)having a first pre-determined length;

said slotted beaconing period (104) comprises a second pre-determined number of medium access slots such that each medium access slot (107) consists of an identical third pre-determined number of beacon slots (105) followed by a space (203) greater than a fourth pre-determined number; and

said data transfer period comprises a remaining number of medium access slots equal to the difference between the first pre-determined number and the second pre-determined number.

11. The method of claim 10, wherein:

said first pre-determined number is 256;

said first pre-determined length is 256usec such that the superframe has a length of 65 msec;

said second pre-determined number is 24;

said third pre-determined number is 3; and

said fourth pre-determined number is equal to the length of a short interframe space (SIFS) (203).

12. An slotted beaconing apparatus for an ad hoc network device (301), comprising:

a receiver (404) for receiving beacons and data transfers from other ad hoc network devices (301);

a transmitter (401) for transmitting own device beacons and data;

a slotted beacon processing component (403) that processes received beacons and received data transfers and own beacons and own data transfers for transmission;

a controller (402) operatively coupled to

- said slotted beacon processing component (403) and configured to divide the medium into a sequence of at least one superframe (102) comprising a slotted beaconing period (104) and a data transfer period (103), to process beacons and data received respectively therein, and format and control own beacons and own data to be transmitted respectively therein;
- said receiver (404) and transmitter (401) and configured to respectively control receipt and transmission of beacons thereby during said slotted beaconing period (104) and to respectively control receipt and transmission of data during said data transfer period (103).

13. The apparatus of claim 12, wherein:

the at least one superframe (102) comprises a first pre-determined number of medium access slots having a first pre-determined length (106);

said slotted beaconing period comprises a second pre-determined number of medium access slots such that each medium access slot (107) consists of an identical third pre-determined number of beacon slots (105) followed by a space (203) greater than a fourth pre-determined number; and

said data transfer period (130) comprises a remaining number of medium access slots equal to the difference between the first pre-determined number and the second pre-determined number.

14. The apparatus of claim 13, wherein:

said first pre-determined number is 256;

said first pre-determined length is 256usec such that the superframe (102) has a length of 65 msec;

said second pre-determined number is 24;

said third pre-determined number is 3; and

said fourth pre-determined number is equal to the length of a short interframe space (SIFS) (203).

15. The apparatus of claim 12, wherein a beacon comprises at least one set of information selected from the group consisting of device identification information and capabilities, a traffic identification map (TIM), a beacon slot occupancy field, related mesh network information, and distributed reservations of the medium.

16. The apparatus of claim 15, wherein the controller is further configured to:

wakes up at the start of the next superframe (102);

if a TIM of any received beacons is addressed to the device:

i. remain awake during the data transfer period (103) of the superframe (102) if the TIM is not clear,

ii. goes to sleep during the data transfer period (103) of the superframe (102) when the TIM is clear; and

iii. goes to sleep if a data frame is received during the data transfer period (103) of the superframe (102) with a "More Data" bit set to zero.

17. The apparatus of claim 12, wherein other devices are discovered during the time of one superframe (102) once at least one other beacon has been received.

18. The apparatus of claim 17, wherein:

information is received in other beacons regarding the neighborhood of the device; and

the information received regarding the neighborhood of the device is used by the controller (402) to direct the transmission of data via a path based on a criteria selected from the group consisting of fewest hops and least cost.

19. The apparatus of claim 12, wherein the controller (402) is further configured to:

determine from the slot occupancy information in the received beacon, which beacon slots (105) are one of idle and received incorrectly;

if, for a pre-determined number of consecutive superframes (102), the beacon slot occupied by the device is determined to be one of idle, received incorrectly, and comprises an information of an other device,

- deem that a collision has occurred in the beacon slot (105) occupied by the device, and
- direct the slotted beacon processing component (403) to resolve the collision according to a pre-determined collision resolution mechanism.